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(54) Improvement for a golf club head of the "iron" type

(57) A golf club head of the "iron" type having a head body comprising a shell (3) constructed by a set of metal walls (9, 10, 11) forming an internal cavity (4), which is generally triangular in planes perpendicular to the striking plane, the front wall (9) being displaced rearwards (AR) with respect to the striking plane (P) and receiving a striking wall (7) of plastics or composite material.

FIG 4

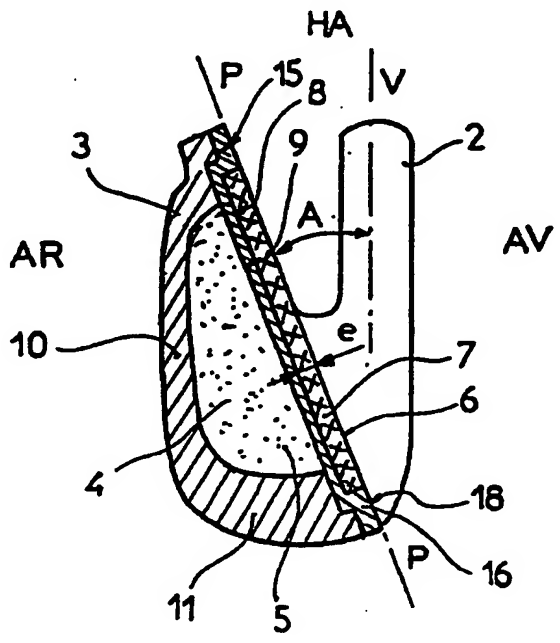

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FIG 1

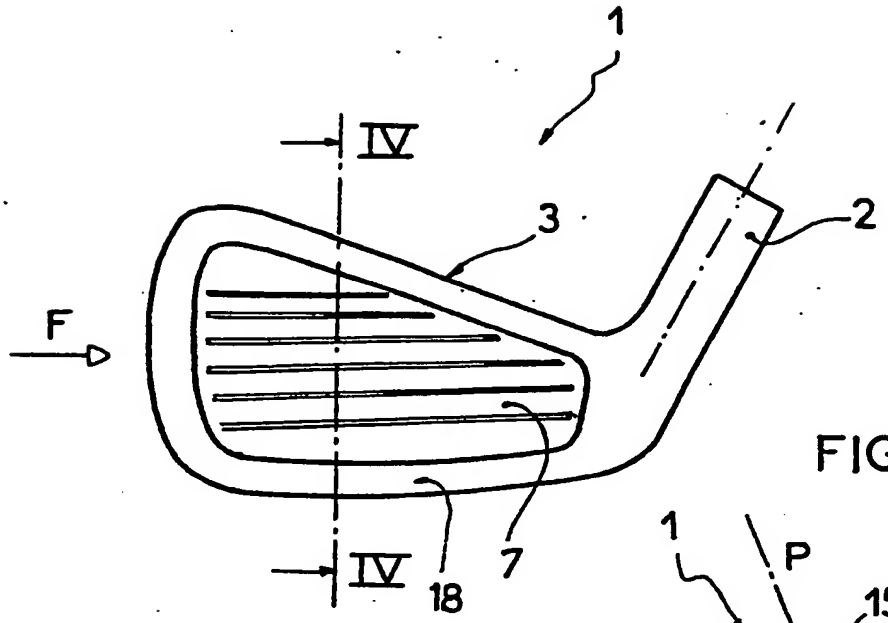

FIG 2

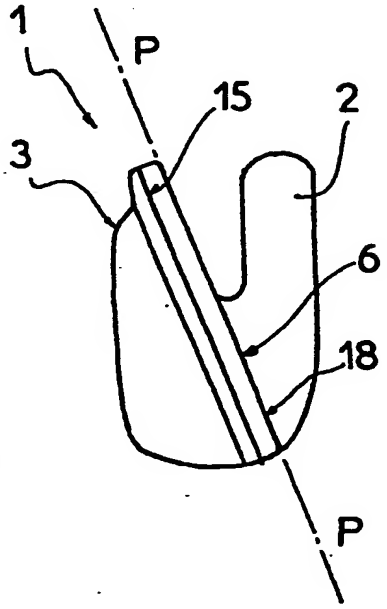

FIG 3

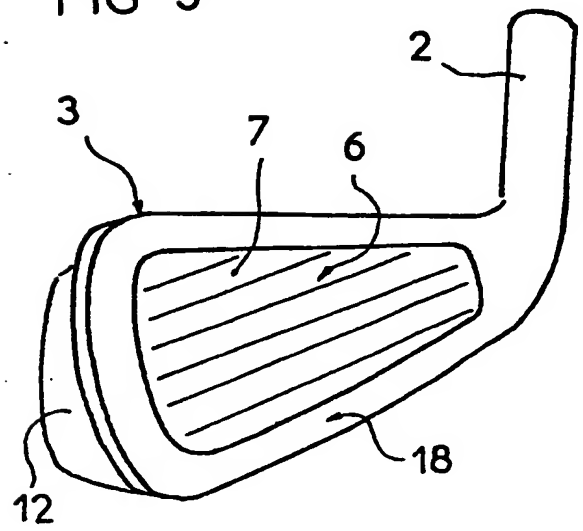

FIG 4

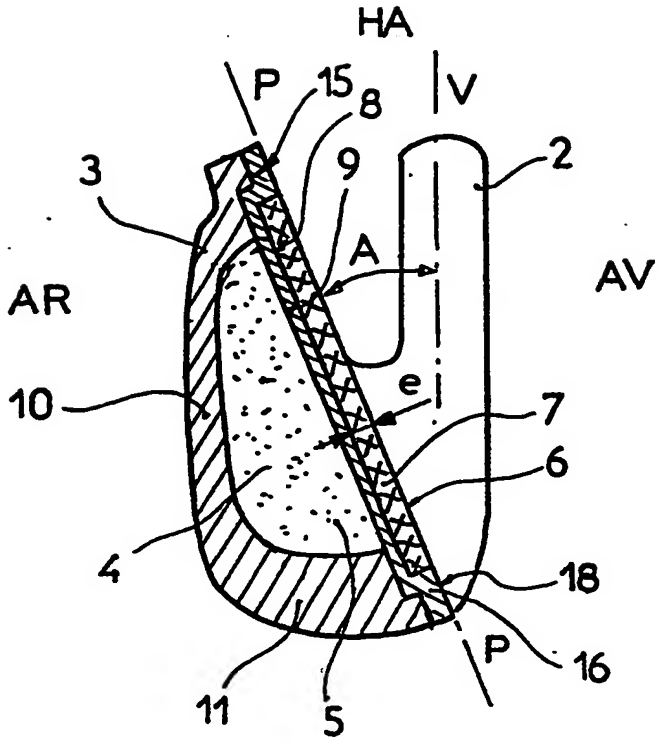
HA
P
15
8
V
3
9
2
A
AR
AV
10
e
7
6
4
18
P
16
11
5

FIG 5

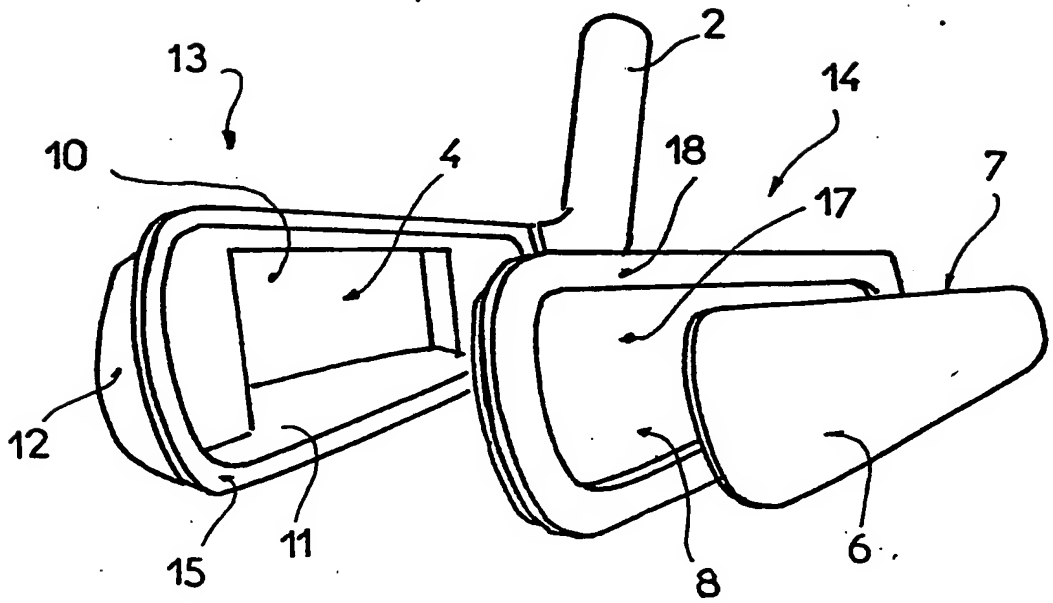
13
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FIG 6

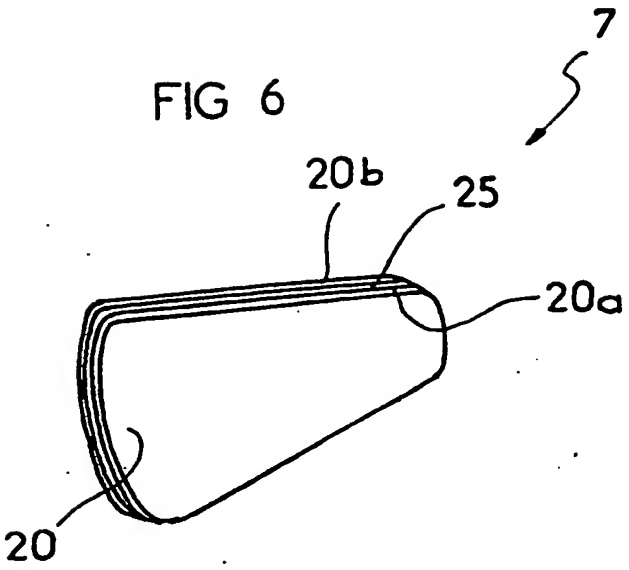


FIG 7

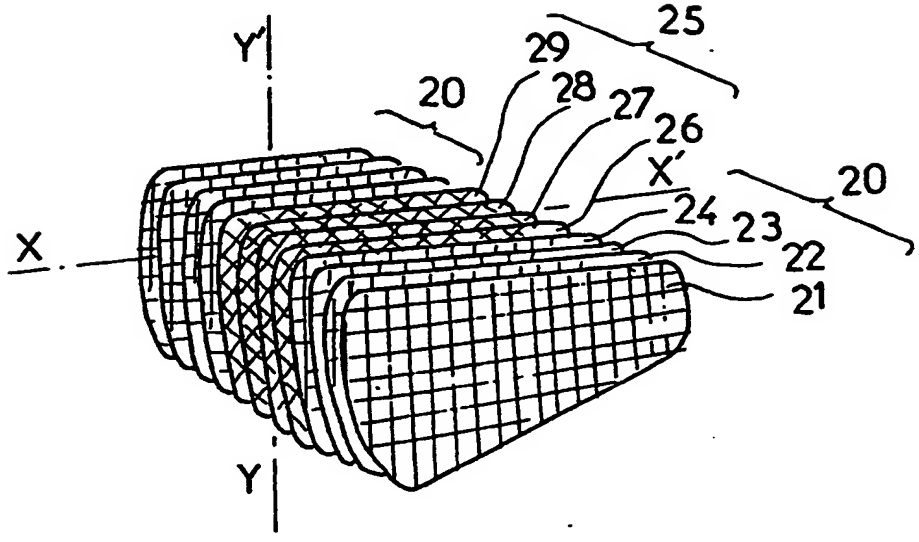


FIG 8

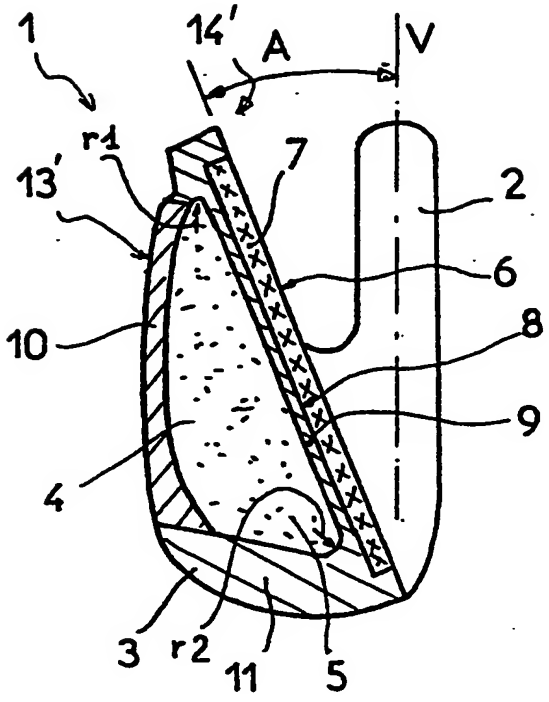
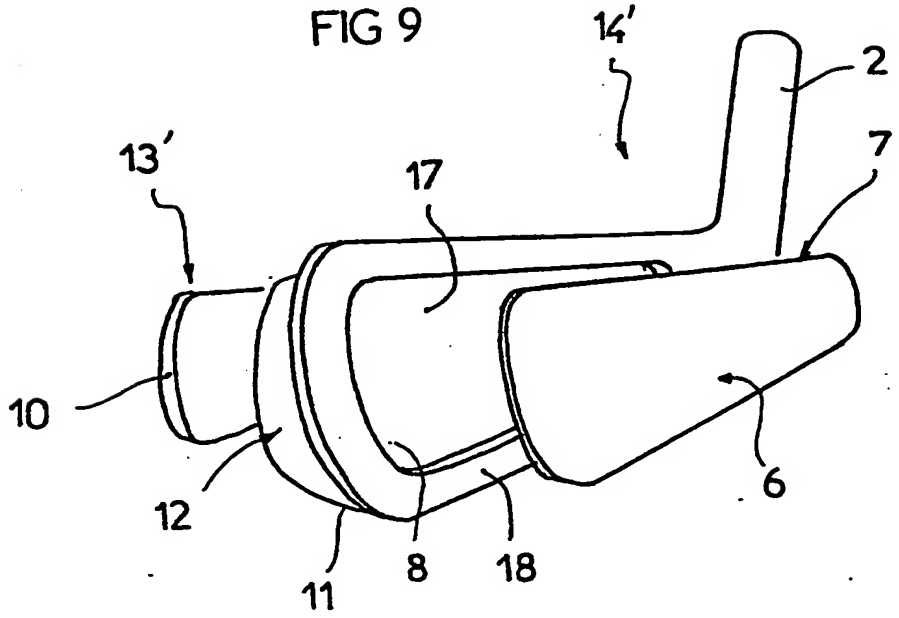


FIG 9



IMPROVEMENT FOR A GOLF CLUB HEAD OF THE "IRON" TYPE

This invention relates to a golf club head and more particularly an improvement for a head incorporating an attached striking face.

When playing golf the player strikes the ball in order to move it, propelling it with a tool called a golf club, which consists of a shank, commonly known as a "shaft" and incorporates a head at its lower end, while its upper end is equipped with a handle called a "grip".

In order to play golf, a player has a number of clubs, each of which is different. To begin with he may use a club called a "wood", while the following shots can be played with a club called an "iron". This latter name comes from the fact that the heads of these clubs have always been made of solid steel.

Every manufacturer provides his own products with a special shape, while complying with a number of rules which are necessary for their approval for competition play. Thus some dimensions, inclinations and masses are laid down, while many other parameters are wholly unrestricted, and this is why there is such a great diversity of products of completely different design.

Clubs marketed at the present time have heads which appear to be satisfactory, this being due solely to their aesthetic appearance, to which particular care has been given by manufacturers. However in use players very quickly come to learn that they have a number of disadvantages, for example their lack of tolerance and the disagreeable sensation felt by the player on impact. A golf club head described in the U.S. patent No. 4,582,321 has a complex structure in which the metal blade is covered, and more specifically surrounded by an envelope of composite material.

The object of this invention is to overcome the aforesaid disadvantages and to provide a head for a club of the type called an "iron" of a completely new design. The head according to the invention can improve impact performance, particularly in the case of long irons. Among other things it also changes the feel when hitting, while maintaining a conventional mass distribution. In addition to this the design of the front wall of the head makes it possible to construct a head in which the thickness of the front metal wall can be reduced, which makes it possible for a given mass of head to have an available mass which can be distributed elsewhere in more critical parts.

In accordance with the present invention there is provided a golf club head of the "iron" type comprising a head body having metal walls enclosing an inner cavity, and including a front wall displaced rearwardly of the striking plane of the head to accommodate a striking wall of plastics or composite material, the inner cavity having a generally triangular shape in planes perpendicular to the striking plane.

In accordance with a preferred embodiment the striking wall is secured, e.g. adhesively bonded to the front face of the front wall so that the front face of

the said striking wall is substantially in the striking plane.

In accordance with another additional feature the front metal wall defines a recessed housing which is intended to receive the striking wall.

In accordance with a preferred embodiment the recessed housing comprises a peripheral rim to retain the striking wall, which comprises a peripheral front surface substantially located in the plane of the striking face.

In accordance with a particular embodiment the front wall has a thickness of between 1 and 3 millimetres, while the striking wall has a thickness of between 1 and 4 millimetres.

The striking wall is constructed for example by stacking several resin-impregnated woven carbon fibre and/or aramide sheets.

Other features and advantages of the invention will become apparent from the following description with reference being made to the appended drawings which are merely given by way of non-restrictive examples.

Figure 1 is a front view of a club head according to the invention.

Figure 2 is a side view from F in Figure 1.

Figure 3 is a perspective view.

Figure 4 is a section along IV-IV in Figure 1.

Figure 5 is an exploded view showing the various components separately.

Figure 6 is a perspective view of the striking wall.

Figure 7 is a detailed perspective view illustrating the construction of the striking wall.

Figures 8 and 9 are views illustrating a

variant embodiment:

Figure 8 is a sectional view similar to Figure 4.

Figure 9 is a perspective view similar to Figure 5.

The golf club head according to the invention and illustrated by way of example comprises, in a manner which is in itself known, a head body proper (1) which is extended laterally by a neck (2) which extends laterally and upwards. The said neck (2) has the general shape of a cylindrical tube to receive the lower end of the club shaft.

Head body (1) for example comprises a set of metal walls thus forming a hollow metal shell (3), the inner cavity (4) of which is advantageously filled with a low density filling material (5), such as a foam, and e.g. polyurethane foam. As may be seen in Figure 4, the cavity is substantially triangular as seen in planes perpendicular to the striking plane (P).

Thus the metal shell (3) comprises a front wall (9) and a rear wall (10) which is extended downwards by a lower wall (11) and laterally outwards by a peripheral or outer side wall (12). The shell is advantageously constructed of two parts or members, a rear member (13) and a front member (14). The said rear member is an integral member and is e.g. moulded with the neck (2) and comprises the rear wall (10), the lower wall (11) and the outer side wall (12) to form inner cavity (4) which is bounded about its periphery and to the front by a peripheral supporting shoulder (15).

In accordance with a preferred embodiment, front member (14) is constructed independently and comprises the front wall (9) of the head body. This

front member (14) is constructed of e.g. steel and is welded about its perimeter to the front of rear member (13). It comprises a central supporting wall closing the cavity and forming the front wall (9) of the shell (3). In addition to this it comprises a peripheral edge or border (16) which is arranged in such a way that the front face (8) of the front wall (9) is offset rearwards with respect to the front peripheral surface (18) of the said peripheral border (16) to form a recessed housing (17) designed to receive the striking wall (7). The said housing has the shape and size of the said striking wall. It should be noted that the front face (8) is thus behind plane (P) and spaced from it at a distance "e" which is substantially equal to the thickness of striking wall (7). Plane (P) is the plane which contains the front peripheral surface (18) of peripheral border (16). This plane of course extends upwards (HA) and rearwards (AR) and corresponds substantially to the plane of striking face (6). The said plane is therefore inclined rearwards by an angle (A) with respect to the vertical (V).

In accordance with one of the features of the invention striking face (6) comprises the front face of a striking wall (7) constructed of composite material and bonded by adhesive or welding to the front face (8) of the front wall (9) of the shell (3) of head body (1). Striking wall (7) is advantageously flat and of constant thickness "e".

In accordance with a feature of the invention striking wall (7) is an independent part of composite material, of substantially constant thickness "e", and is assembled to the front face (8) of front wall (9) by adhesive bonding, screwing or any other means.

As a composite material the applicant intends to use woven sheets of carbon and/or aramide fibres impregnated with a thermoplastic or thermohardening resin material. The fibres preferred by the applicant include long carbon fibres of high mechanical strength with an elastic modulus of between 230 and 590 GPa and a tensile strength of 2450 to 7000 MPa. Such values are of course superior to those of known conventional steels. The matrices or resins may be of the polyphenylene sulphide (PPS), polyether imide (PEI), polyether-ether-ketone (PEEK) or epoxy type.

Striking wall (7) preferably comprises a stack of several woven fibre sheets in e.g. two directions. The special orientation of the fibres forming each woven sheet is shown way of example in Figure 7. According to this embodiment a wall comprises first sheets (20, 21, 22, 23, 24) in which the fibres are orientated along both the horizontal axis (XX') and the vertical axis (YY'). The wall also includes second sheets (25, 26, 27, 28, 29) orientated so that they are offset by +45° and -45° with respect to the horizontal axis (XX'). Preferably the wall comprises a stack of 10 to 25 successive sheets (20, 25) of fibres.

In order to optimise the strength of wall (7) the applicant has established a particularly advantageous sequence of first sheets (20) and second sheets (25) in the manner illustrated in Figure 6. The wall thus comprises a sequence of a first outer layer (20a) of first sheets (20) in which fibres are orientated along the axes (XX') and (YY'), a second intermediate layer of second sheets (25) in which the fibres are orientated at +45° and -45° to axis (XX'), and a third inner sheet (20b) of first sheets (20) in which the fibres are orientated along the axes (XX') and (YY'). The second

intermediate layer comprises between approximately 3 and 9 sheets.

The first outer layer (20a) is designed to withstand the compression forces due to the shock from the ball and the third inner layer (20b) is designed to withstand tensile forces. Forces are mainly orientated along axis (XX') and (YY'). The second intermediate layer (25) is designed to withstand shear forces around the neutral fibre, mainly orientated at +45° and -45° with respect to axis (XX').

An example of the construction of a resistant wall (7) of composite material and its mechanical properties may be given by way of example.

The wall comprises a stack of balanced woven carbon fibre sheets and epoxy resin. The volume ratio between the fibres and resin is equal to 1. The thickness of one sheet is
0.2 mm. The fibres have an elastic modulus of 230 GPa and a tensile strength of 4410 MPa (fibre of the T300J type from TORAY).

The stack consists of a first outer layer (20a) of 6 woven sheets having fibres orientated along axes (XX') and (YY') (an orientation said to be "0°, 90°"), a second intermediate layer (25) of 5 sheets of woven fibres orientated at +45°, -45 to axis (XX') and a third inner layer (20b) of 6 sheets of woven fibres orientated at 0°, 90°.

It may also be specified that a construction comprising a second intermediate layer of 3 or less sheets of fibres only around the neutral fibre does not provide sufficient resistance to the shock from the ball and causes fracture of the wall (7). This fracture is also found with a construction comprising a second intermediate layer of 9 or more sheets of woven fibres

at +45°, -45° partially replacing the woven sheets of fibres at 0°, 90°.

Striking face (6) is, as in itself known, flat, and lies in a plane (P) which extends upwards (HA) and rearwards (AR). In accordance with the invention front metal wall (9) of shell (3) of head body (1) is offset rearwards with respect to plane (P) in order to be at a distance "e" therefrom, equal to the thickness of the striking wall. With such an arrangement the front mass of the head is moved rearwards, which makes the club more tolerant in use. Furthermore the association of front wall (9) and striking face (6) at the front makes it possible to have a head in which the thickness of the front metal wall (9) can be considerably decreased, which for a head of given mass provides an available mass which can be distributed elsewhere in more critical areas.

Figures 8 and 9 illustrate a variant embodiment in which the front wall is cast or moulded with the shell instead of being fitted to it as in the previous embodiment. Thus it is the rear wall which is fitted to the shell to enclose the inner cavity and thus allow the shell to be moulded. When reading figures 8 and 9 similar components to those in the foregoing embodiment bear the same reference numbers. This embodiment will not therefore be described in detail. It should however be noted that head body (1) thus comprises a set of metal walls thus forming a hollow metal shell (3) in which the inner cavity (4)is advantageously filled with a filling material (5) such as a foam, and e.g. polyurethane foam. The said metal shell (3) comprises a front wall (9) and a rear wall (10) extended downwards by a lower wall (11) and laterally outwards by an outer side wall (12). The shell is advantageously constructed

of two parts or members, a rear member (13') and a front member (14'). The said front member is of one piece and is for example moulded with the neck (2) and comprises the front wall (9), the lower wall (11) and the outer side wall (12) to form inner cavity (4) which opens rearwards and is then enclosed by rear wall (10) which is attached e.g. by welding.

As previously the front wall includes a peripheral border (16) arranged in such a way that the front face (8) of front wall (9) is offset rearwards with respect to the front peripheral surface (18) of the said peripheral border (16) to form a recessed housing (17) designed to receive striking wall (7). The said housing has the shape and dimensions of the said striking wall. It will be noted that the front face (8) is therefore located behind plane (P) at a distance "e" which is substantially equal to the thickness of striking wall (7). Plane (P) is the plane containing the front peripheral surface (18) of peripheral border (16). This plane of course extends upwards (HA) and rearwards (AR) and corresponds substantially to the plane of striking face (6). Also, and as before, striking face (6) comprises the front face of a striking wall (7) constructed of a composite material and bonded by adhesive bonding or welding to the front face (8) of the front wall (9) of shell (3) of head body (1). Striking wall (7) is advantageously flat and of constant thickness "e", and in accordance with one of the features of the invention, is an independent piece of composite material of substantially constant thickness "e", and is fitted to the front face (8) of front wall (9) by adhesive bonding, screwing or any other means.

In accordance with advantageous arrangements the thickness of striking wall (7) lies between 1 and 4

millimetres and the thickness of the front wall (9) of the envelope lies between 1 and 3 millimetres. Advantageously the thickness of striking wall (7) lies between 2 and 4 millimetres, while the thickness of the front wall lies between 2 and 3 millimetres. It should also be noted that the reinforcement forming the striking wall may be of any type and in particular of the woven or non-woven type. The peripheral junction between the front of the cavity and the front wall is such that this forms a fillet. The upper fillet has a radius (r1) which is smaller than the radius (r2) of the lower fillet (Figure 8); (r1) may be 3 millimetres and radius (r2) may be 5 millimetres.

Of course the invention is not restricted to the embodiments described and illustrated by way of example, but also includes all technical equivalents and their combinations.

CLAIMS

1. A golf club head of the "iron" type comprising a head body having metal walls enclosing an inner cavity (4) and including a front wall displaced rearwardly of the striking plane of the head to accommodate a striking wall of plastics or composite material, the inner cavity having a generally triangular shape in planes perpendicular to the striking plane.

2. A golf club head according to claim 1, wherein the striking wall is secured to the front face of the front wall so that the front face of the said striking wall is substantially in the striking plane.

3. A golf club head according to claim 1 or 2, wherein the front wall forms a recessed housing in which the striking wall is received.

4. A golf club head according to claim 3, wherein the recessed housing has a peripheral portion extending around and retaining the striking wall.

5. A golf club head according to claim 4, wherein said peripheral portion defines a front peripheral surface substantially coplanar with the front face of the striking wall.

6. A golf club head according to any one of the preceding claims, wherein the front wall has a thickness of between 2 and 3 millimetres.

7. A golf club head according to any one of the preceding claims, wherein the striking wall has a thickness of between 2 and 4 millimetres.

8. A golf club head according to any one of the preceding claims, wherein the striking wall is constructed of a stack of several resin-impregnated woven carbon fibre and/or aramide sheets.

9. A golf club head according to any one of the preceding claims, wherein the striking wall is secured to the front metal wall by adhesive bonding.

10. A golf club head according to any one of the preceding claims, wherein the shell formed by the metal walls is assembled from a rear member and a front member.

11. A golf club head according to claim 10, wherein the rear member includes a rear wall and a bottom wall, and the front member forms the front wall.

12. A golf club head according to claim 11, wherein the rear member is extended laterally and upwardly by a neck.

13. A golf club head substantially as herein described with reference to the accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number
GB 9313893.1

Relevant Technical fields

(i) UK Cl (Edition L) A6D (D23B)

(ii) Int Cl (Edition 5) A63B 53/04

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner
D W WHITFIELD

Date of Search
5 AUGUST 1993

Documents considered relevant following a search in respect of claims 1-13

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

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P: Document published on or after the declared priority date but before the filing date of the present application.

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